geospatial browser to server-based datasets — in particular, massively sized datasets — has been developed. The method specifically uses the Keyhole Markup Language (KML), an Open Geospatial Consortium (OGS) standard used by Google Earth and other KML-compliant geospatial client applications. The innovation is based on establishing a dynamic cascading KML strategy that is initiated by a KML launch file provided by a data server host to a Google Earth or similar KML-compliant geospatial client application user. Upon execution, the launch KML code issues a request for image data covering an initial geographic region. The server responds with the requested data along with subsequent dynamically generated KML code that directs the client application to make follow-on requests for higher level of detail (LOD) imagery to replace the initial imagery as the user navigates into the dataset. The approach provides an efficient data traversal path and mechanism that can be flexibly established for any dataset regardless of size or other characteristics. The method yields significant improvements in user-interactive geospatial client and data server interaction and associated network bandwidth requirements.

The innovation uses a C- or PHP-code-like grammar that provides a high degree of processing flexibility. A set of language lexer and parser elements is provided that offers a complete language grammar for writing and executing language directives. A script is wrapped and passed to the geospatial data server by a client application as a component of a standard KML-compliant statement. The approach provides an efficient means for a geospatial client application to request server preprocessing of data prior to client delivery.

Data is structured in a quadtree format. As the user zooms into the dataset, geographic regions are subdivided into four child regions. Conversely, as the user zooms out, four child regions collapse into a single, lower-LOD region. The approach provides an efficient data traversal path and mechanism that can be flexibly established for any dataset regardless of size or other characteristics.

This work was done by Gregory Baxes, Brian Mixon, and Tim Linger of TerraMetrics, Inc. for Stennis Space Center. For more information call the SSC Center Chief Technologist at (228) 688-1929. Refer to SSC-00362/5.

Automated Planning of Science Products Based on Nadir Overflights and Alerts for Onboard and Ground Processing

NASA's Jet Propulsion Laboratory, Pasadena, California

A set of automated planning algorithms is the current operations baseline approach for the Intelligent Payload Module (IPM) of the proposed Hyperspectral Infrared Imager (HyspIRI) mission. For this operations concept, there are only local (e.g. non-depletable) operations constraints, such as real-time downlink and onboard memory, and the forward sweeping algorithm is optimal for determining which science products should be generated onboard and on ground based on geographical overflights, science priorities, alerts, requests, and onboard and ground processing constraints.

This automated planning approach was developed for the HyspIRI IPM concept. The HyspIRI IPM is proposed to use an X-band Direct Broadcast (DB) capability that would enable data to be delivered to ground stations virtually as it is acquired. However, the HyspIRI VSWIR and TIR instruments will produce approximately 1 Gbps data, while the DB capability is 15 Mbps for a ≈60× oversubscription. In order to address this mismatch, this innovation determines which data to downlink based on both the type of surface the spacecraft is overflying, and the onboard processing of data to detect events. For example, when the spacecraft is overflying Polar Regions, it might downlink a snow/ice product. Additionally, the onboard software will search for thermal signatures indicative of a volcanic event or wild fire and downlink summary information (extent, spectra) when detected, thereby reducing data volume. The planning system described above automatically generated the IPM mission plan based on requested products, the overflight regions, and available resources.

This work was done by Steve A. Chien, David A. McLaren, and Gregg R. Rabideau of Caltech; Daniel Mandl of NASA Goddard Space Flight Center; and Jerry Hengemihle of Microtel LLC for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). NPO-47875

Linked Autonomous Interplanetary Satellite Orbit Navigation

Single satellite can track another satellite elsewhere in the Earth-Moon system and obtain absolute knowledge of both satellites' states.

NASA's Jet Propulsion Laboratory, Pasadena, California

A navigation technology known as LiAISON (Linked Autonomous Interplanetary Satellite Orbit Navigation) has been known to produce very impressive navigation results for scenarios involving two or more cooperative satellites near the Moon, such that at least one satellite must be in an orbit significantly perturbed by the Earth, such as a lunar halo orbit. The two (or more) satellites track each other using satellite-to-satellite range and/or range-rate measurements. These relative measurements yield absolute orbit navigation when one of the satellites is in a lunar halo orbit, or the like.

The geometry between a lunar halo orbiter and a GEO satellite continuously changes, which dramatically improves the information content of a satellite-to-satellite tracking signal. The